

GH-BETTIS

SERVICE INSTRUCTIONS

DISASSEMBLY AND REASSEMBLY

FOR THE FOLLOWING MODELS

KT3XX-SR, KT3XX-SR-M3, KT3XX-SR-M3HW,

KT4XX-SR, KT4XX-SR-M3, & KT4XX-SR-M3HW

SPRING RETURN SERIES

K-MASS ACTUATORS

PART NUMBER: 074974

REVISION: "A"

DATE: March, 1992

1.0 INTRODUCTION

- 1.1 This service procedure is offered as a guide to enable general maintenance to be performed on GH-Bettis KT3XX-SRX, KT3XX-SRX-M3, KT3XX-SRX-M3HW, KT4XX-SRX, KT4XX-SRX-M3, and KT4XX-SRX-M3HW series K-Mass actuators.
- 1.2 The maximum recommended service interval for this series of actuator is five years. Storage time is counted as part of the service interval.
- 1.3 This procedure is written with the understanding that all operating power has been removed from the actuator, allowing the spring to stroke and rotate the yoke to the actuators fail position. Also it is understood that the actuator has been removed from the valve as well as all piping and accessories that are mounted on the actuator have been removed.

**COMPLETE ACTUATOR REFURBISHMENT
REQUIRES THAT THE ACTUATOR BE
DISMOUNTED FROM THE VALVE**

2.0 SUPPORT ITEMS AND TOOLS

- 2.1 Support Items - Service Kit, razor sharp cutting instrument, latex window caulking, commercial leak testing solution, and non-hardening thread sealant, two each 7/8-9 UNC hex nuts.
- 2.2 Tools - All tools are American Standard inch. Two each medium screwdriver, small standard screwdriver with corners rounded, putty knife, strap wrench, allen wrench set, 3/16" in punch, rubber or leather mallet and torque wrench (up to 5,000 in.lbs.). For recommended tool list refer to page 10 of 11.

3.0 REFERENCE GH-BETTIS MATERIALS

- 3.1 Assembly Drawing 036040 for KT3XX-SRX(CW)-M3/HW failing close actuators.
- 3.2 Assembly Drawing 048025 for KT3XX-SRX(CCW)-M3/HW failing open actuators.
- 3.3 Exploded Detail Drawing 063406 for KT3XX-SRX actuators.
- 3.4 Exploded Detail Drawing 065598 for KT3XX-SRX-M3/HW actuators.
- 3.5 Assembly Drawing 035730 for KT4XX-SRX(CW)-M3/HW failing close actuators.
- 3.6 Assembly Drawing 048027 for KT4XX-SRX(CCW)-M3/HW failing open actuators.
- 3.7 Exploded Detail Drawing 063409 for KT4XX-SRX actuators.
- 3.8 Exploded Detail Drawing 065599 for KT4XX-SRX-M3/HW actuators.

4.0 GENERAL

- 4.1 Numbers in parentheses, () indicate the bubble number (reference number) used on the GH-Bettis Assembly Drawing, Exploded Detail Drawing, and Actuator Parts Lists.
- 4.2 This procedure is written using the stop screw side of the housing (1-10) as a reference and this side will be considered the front of the actuator. The housing cover (1-20) will be the top of the actuator.
- 4.3 To ensure correct re-assembly; that is, with spring on same end of housing as was, mark or tag right or left and mark mating surfaces.
- 4.4 When removing seals from seal grooves, use a small screwdriver with sharp corners rounded off or a commercial seal removing tool.

- 4.5 Use a non-hardening thread sealant on all pipe threads. **CAUTION: Apply the thread sealant per the manufacture's instructions.**
- 4.6 Disassembly of actuator should be done in a clean area on a work bench.
- 4.7 LUBRICATION REQUIREMENTS: Standard and high temperature service (-20°F to +350°F) use GH-Bettis ESL-5 (Kronaplate 100). ESL-5 is contained in the GH-Bettis Service Kit.
- 4.8 It is a good practice to operate the actuator with the nominal operating pressure (NOP), as listed on the actuator nametag or the pressure used by the customer to operate the actuator during normal operation, before starting the general disassembly of the actuator. Notate and record any abnormal symptoms such as jerky or erratic operation. NOTE: Pressure is not to exceed the maximum operating pressure rating listed on the name tag.

5.0 GENERAL DISASSEMBLY

- 5.1 If an M3 Jackscrew is mounted in the power cylinder (2-10), the M3 (2-210) should not contact the end of the piston rod (2-170).
- 5.2 For actuator equipped with M3HW jackscrew override with handwheel option, remove hex nut (8-30), lockwasher (8-20), and handwheel (8-10).
- 5.3 Measure the exposed length of right and left stop screws (1-60) and record each before loosening for removal.
- 5.4 Remove the socket cap screws (1-180) from position indicator (1-170) yoke weather cover (3-130) and remove position indicator/yoke weather cover.
- 5.5 Remove the latex caulking that covers all the hardware on the housing cover. Cut through the latex caulking that seals all joints where the actuator parts are disassembled.

6.0 SPRING CARTRIDGE REMOVAL

- 6.1 **WARNING: Under no circumstances should the spring cartridge be cut apart, as the spring is pre-loaded and the spring cartridge welded together.**
- 6.2 When the spring cartridge is installed on the actuator the spring is under compression. **CAUTION: DO NOT remove the spring cartridge until the actuator has the stop screw "pre-load" removed.**
- 6.3 Remove spring cartridge stop screw "pre-load" as follows: Apply nominal operating pressure to the pressure inlet port located in the outer end cap (2-30). Locate the stop screw (1-60) that is on the opposite side of the housing from the spring cartridge (4-10). Loosen jam nut (1-120). Unscrew and remove stop screw (1-60). Remove pressure from the pressure inlet port.
- 6.4 Remove socket head screw (4-60), lockwasher (4-50) and nut retainer (4-40) from the end of the spring cartridge assembly (4-10).
- 6.5 Alternately loosen the two large hex nuts on the outboard end of the spring cartridge (4-10). These nuts are welded to the tie bars that extend through the spring cartridge and screw into the actuator housing (1-10). Unscrew the tie bars until the spring cartridge is free from the housing. Care should be taken so that the tie bars are not pulled back into the spring cartridge.

- 6.6 To keep from inadvertently pulling the tie bars back into the spring cartridge use 7/8 inch 9 UNC hex nuts and screw them on to the spring cartridge tie bars. Place the spring cartridge to one side.

7.0 PRESSURE CYLINDER DISASSEMBLY

- 7.1 Remove breather (4-30) from inner end cap (2-40).
- 7.2 OUTER END CAP REMOVAL With M3 use steps 7.3 thru 7.5. Without M3 use steps 7.6 thru 7.9.
- 7.3 Loosen and thread jam nut (2-130) all the way back to the welded nut.
- 7.4 Loosen and remove socket cap screws (2-200) from jackscrew adapter (2-190).
- 7.5 Back jackscrew adapter (2-190) out until clear of hex nuts (2-90), now go to step 7.9.
- 7.6 Outer end cap (2-30) without M3 or M3HW jackscrew override will be disassembled as follows: Unscrew and remove socket head cap screw (2-120), lockwasher (2-110), and nut retainer (2-100).
- 7.7 Remove heavy hex nuts (2-90) from tie bars (2-60).
- 7.8 Remove outer end cap (2-30). The fit between the cylinder (2-10) and the outer end cap is very tight. Break the outer end cap free by tapping with a breaker bar on the lip provided on the end cap.
- 7.9 Pry inner end cap (2-40) away from the housing (1-10). Break the inner end cap free from the cylinder (2-10) by tapping with a breaker bar on the lip provided on the end cap.
- 7.10 Remove the cylinder (2-10). NOTE: When sliding the cylinder off of the piston, tilt the cylinder to the piston rod, approximately 15° to 30° degrees.
- 7.11 Remove the split ring retainer (2-80) and the split ring (2-70) from the outboard side of the piston (2-20). **CAUTION: Keep the split rings in matched sets.**
- 7.12 Remove the piston (2-20) from the piston rod (2-170). The piston will slide off of the piston rod.
- 7.13 Remove the inboard split ring retainer (2-80) and the split ring (2-70) from the piston rod (2-170). **CAUTION: Keep the split rings in matched sets.**
- 7.14 Slide the inner end cap (2-40) off over the tie bars (2-60) and piston rod (2-170).
- 7.15 Unscrew the tie bars (2-60) from the housing (1-10). Flats are provided on the outboard end of the tie bars for wrench placement. **DO NOT** use a pipe wrench on the tie bars as it will mark the bars and cause seal leakage. (This step is optional as the tie bars can be left in the housing).

8.0 JACKSCREW DISASSEMBLY

- 8.1 For actuators equipped with M3 or M3HW jackscrew override, use the following procedure for jackscrew disassembly:
- 8.2 Using a pin punch, drive out and remove pin from jackscrew stud and slotted thrust nut.
- 8.3 Thread the slotted thrust nut against the timken bearing until the bearing retainer and the retaining ring are forced off of the end of the M3 stud. Then continue to thread the slotted thrust nut until the bearing and the nut are removed from the M3 stud.
- 8.4 Remove the M3 stud from the outer end cap (2-30).

9.0 HOUSING GROUP DISASSEMBLY

- 9.1 Unscrew push rod (4-20) from yoke pin nut (1-30) and remove from housing (1-10).
- 9.2 Unscrew piston rod (2-170) from yoke pin nut (1-30) and remove, including the rod bushing (2-50). Flats are provided on the outboard end of the piston rod for wrench placement. **DO NOT** use a pipe wrench on the piston rod as it will mark the rod and cause seal leakage.
- 9.3 Remove snubber (1-190) from housing cover (1-20).
- 9.4 Remove cover screws (1-90) and gasket seals (3-100).
- 9.5 Remove the housing cover (1-20). NOTE: This piece will have a very tight fit.
- 9.6 Remove the top two yoke rollers (1-50) from the top of the yoke pin (1-40).
- 9.7 Remove yoke pin (1-40).
- 9.8 Remove yoke pin nut (1-30).
- 9.9 Remove bottom two yoke rollers (1-50) from the housing.
- 9.10 Remove the yoke (1-160) by lifting it from the housing.
- 9.11 Remove the remaining stop screw (1-60), jam nut (1-120), and seal gasket (3-110). Be sure to mark or identify this stop screw.
- 9.12 It is not necessary to remove the drain pipe plug (1-80) or grease fittings (1-70) to service the actuator.

10.0 GENERAL RE-ASSEMBLY

- 10.1 Remove and discard all old seals and gaskets, taking care not to scratch or damage seal grooves.
- 10.2 All parts should be cleaned to remove all dirt and other foreign material prior to inspection.
- 10.3 All parts should be thoroughly inspected. Particular attention should be directed to threads, sealing surfaces and areas that will be subjected to sliding motion. Sealing surfaces must be free of deep scratches, pitting, corrosion and blistering or flaking coating.
- 10.4 All K-Mass coated parts should be inspected for damage to the coating. Replace or repair all K-Mass parts that are damaged.
- 10.3 Coat all surfaces of actuators moving parts with lubricant.
- 10.4 Coat all seals with lubricant, before installing into grooves, also both sides of gaskets.
- 10.5 T Seal Set installation - The T-seal is composed of one rubber seal and two split skive-cut back-up rings.
 - 10.5.1 Install the T-seal into the seal groove.
 - 10.5.2 Install a back-up ring on each side of the T-seal.
 - 10.5.3 When installing the back-up rings, do not align the skive-cuts.

10.5.4 If the back-up rings are too long and the rings overlap beyond the skive-cuts, then the rings must be trimmed with a razor sharp instrument.

11.0 CENTER HOUSING GROUP RE-ASSEMBLY

- 11.1 Install one yoke o-ring seal (3-50) into the housing (1-10).
- 11.2 Inside the housing (1-10) apply lubricant to the tracks and yoke bore and arrange the housing with the yoke bore nearest you.
- 11.3 Apply lubricant to the yoke (1-160) lower bearing surface and install into the housing (1-10) as follows: Position the yoke arm to approximately at 45° degree position in either direction and lower into the housing. The hub with tapped holes faces up. Rotate the yoke back to approximately the mid-stroke (center) position.
- 11.4 Apply lubricant to the slots in the upper and lower yoke arms.
- 11.5 Apply lubricant to all surfaces of all four yoke rollers (1-50). Place one yoke roller (1-50) in the track in the bottom of the housing and position it under the slot in the yoke arms. Place a second yoke roller on top of the first yoke roller in the slot in the lower yoke arm and align the holes in the yoke rollers.
- 11.6 Coat the upper and lower surfaces of the yoke pin nut (1-30) with lubricant and insert into position between the yoke arms, parallel to the track in the housing. Align the yoke pin hole with the yoke rollers.
- 11.7 Lubricate the yoke pin (1-40) and insert through the yoke pin nut (1-30) and the two yoke rollers (1-50).
- 11.8 Install the third yoke pin roller over the yoke pin in the slot in the upper yoke arm and now install the fourth and last remaining yoke roller on top of the yoke roller you just installed in the upper yoke arm slot. The top roller will remain partially above the yoke and will engage the cover track when cover is installed.
- 11.9 Slide piston rod (2-170) into the side of body and screw into the yoke pin nut (1-30). **DO NOT TIGHTEN.** For spring to open actuators, install the piston rod on the left side of the housing. For spring to close actuators, install the piston rod on the right hand side of the housing.
- 11.10 Install the rod bushing (2-50) over the piston rod and slide it into the housing. **DO NOT** tighten the piston rod until the housing cover is installed.
- 11.11 Slide push rod (4-20) into side of body and screw into the yoke pin nut (1-30). Tighten the push rod with a strap wrench or a pipe wrench.
- 11.12 Place gaskets (3-110) and jam nut (1-120) onto the stop screws (1-60). Install the stop screws into the housing, making sure the stop screw marked "left" is installed into the left stop screw hole.
- 11.13 Place the housing cover gasket (3-20) onto the housing (1-10).
- 11.14 Install the remaining yoke o-ring seal (3-50) into cover (1-20).
- 11.15 Apply lubricant to the yoke bore and the track in the housing cover (1-20).
- 11.16 Apply lubricant to the upper bearing surface of the yoke (1-160).

11.17 Install the housing cover (1-10), being careful not to damage the gasket (3-20) or yoke o-ring (3-50).

- 11.18 Install the cover screws (1-90) and seal gaskets (3-100). LEAVE FINGER TIGHT-DO NOT TIGHTEN.
- 11.19 NOTE: Do this step only if you have pulled the cover pins (1-130) or if you are replacing the cover pins. Drive the four pins (1-130) thru the cover (1-20) and into the housing (1-10) until the pin is flush with the cover. The pins are deeply grooved at one end, tapering to a smooth diameter at the other end. The pin should be installed smooth end first.
- 11.20 Tighten the cover screws (1-90).
- 11.21 Tighten the piston rod (2-170) (installed in step 11.10) to a torque of approximately 1800 in.lbs. (150 ft. lbs.). Flats are provided on the outer end for wrenching purposes. **CAUTION: Do not use a pipe wrench or similar tool to tighten piston rod.**
- 11.22 POSITION INDICATOR INSTALLATION - See step 11.24 for spring to close actuators (CW) or step 11.25 for spring to open (CCW) actuators.
- 11.23 For spring to close actuators (clockwise) rotate the yoke to the full clockwise (CW) position (as shown on the clockwise assembly drawings) position the yoke weather cover (3-130) /position indicator (1-170) on the yoke with the pointer facing the front and perpendicular to the piston rod (2-170). Secure with the socket head cap screws (1-180).
- 11.24 For spring to open actuators (counterclockwise), rotate the yoke to the full counterclockwise (CCW) position (as shown on the counterclockwise assembly drawings), position the yoke weather cover (3-130) position indicator (1-170) on the yoke with the pointer facing the right and parallel with the piston rod (2-170). Secure with the socket head cap screws (1-180).
- 11.25 Rotate the yoke to a position that will leave a minimum of the piston rod (2-170) protruding from the actuator housing.

12.0 PRESSURE CYLINDER RE-ASSEMBLY

- 12.1 Install the rod seal (3-70), lip first, into the recess provided in the inner end cap (2-40).
- 12.2 Install one of the end cap gaskets (3-10) over the piston rod and rod bushing.
- 12.3 Slide the inner end cap (2-40) over the piston rod (2-170) and the rod bushing (2-50), protruding from the housing. Install with the large raised boss toward the housing (flat side outward). The inlet port should be toward the top of the actuator.
- 12.4 Install the o-ring seal (3-60) onto the inner end cap (2-40).
- 12.5 Install two sets of piston tie bar T-seal components (3-80) into the piston internal seal groove. Refer to steps 10.5 for proper T-seal installation instructions.
- 12.6 Install the piston o-ring seal (3-40) onto the piston rod (2-170).
- 12.7 Coat the ends of the piston rod (2-170) with lubricant.
- 12.8 Install a matched set of split rings (2-70) into the inner most groove in the piston rod and retain with one of the retaining rings (2-80).
- 12.9 Slide the piston (2-20) onto the piston rod against the split ring (2-70).
- 12.10 Install a matched set of split rings (2-70) onto the piston rod and retain with the retaining ring (2-80).

12.11 Install the piston T-seal components (3-90) into the piston external seal groove.

- 12.12 Apply lubricant to the threads and end of the tie bars (2-60), end without wrench flat, and install by carefully pushing tie bars through the piston (2-20).
- 12.13 Install two tie bar o-ring seals (3-30) onto the inboard end of the tie bars (2-60) into the o-ring grooves provided.
- 12.14 Insert the tie bars through the inner end cap (2-40) and screw into the housing (1-10). Tighten until threads bottom out, then back out a half-turn.
- 12.15 Apply lubricant to the entire bore of the cylinder (2-10).
- 12.16 Slide the lubricated cylinder (2-10) over the piston (2-20) and onto the inner end cap (2-40). **NOTE:** When sliding the cylinder over the piston seal, tilt cylinder 15° to 30° to the piston rod. **DO NOT** hammer on the ends of cylinder (2-10).

CAUTION: Make certain the back-up rings (components of the piston seal) are seated into the seal groove. Should the back-up rings or seal member be pinched between the piston and cylinder, the component could be damaged, becoming a potential source of leakage.

- 12.17 Install two end cap tie bar o-ring seals (3-30) onto the outboard end of the tie bars (2-60) into the o-ring groove provided.
- 12.18 Install the outer end cap cylinder o-ring seal (3-60) onto the outer end cap (2-30).
- 12.19 Install the outer end cap (2-30) onto the tie bars (2-60) and into the end of the cylinder (2-10).
- 12.20 OUTER END CAP INSTALLATION WITH M3 pre-assemble M3 outer end cap per step 12.21 then use steps 12.23 thru 12.29 or WITHOUT M3 use steps 12.29 and 12.30.
- 12.21 PRE-ASSEMBLY M3 JACKSCREW OUTER END CAP:
- 12.21.1 Apply a light coating of lubricant to the threads of jackscrew assembly (2-210).
- 12.21.2 If removed, thread on the nut seal (2-130) onto jackscrew assembly (2-210).
- 12.21.3 Lightly lubricate the o-ring groove area on the jackscrew adapter (2-190).
- 12.21.4 Lightly lubricate the o-ring seal (100) and install into o-ring groove on jackscrew adapter (2-190).
- 12.21.5 Thread jackscrew adapter (2-190) onto jackscrew assembly (2-210).
- 12.21.6 Insert jackscrew assembly (2-210) through outer end cap (2-30) and retain with socket-head cap screws (2-200). Leave socket head cap screws (2-200) finger tight.
- 12.21.7 Install slotted thrust nut on to turned-down end of M3 stud with slotted face toward the outer end cap. Thread the nut past the pin hole in the M3 stud.
- 12.21.8 Assemble the bearing onto the bearing retainer with the inner race facing the retainer flange. Insert the wire "C" ring into the bearing side of the retainer assembly until the "C" ring opens up into its groove.
- 12.21.9 Press the retainer assembly onto the turned-down end of the stud, using a wood block and a hammer. **NOTE:** The wire "C" ring needs to be forced onto the neck of the stud end.

- 12.21.10 Begin to un-thread the thrust nut. Continue till the nut mates with face of bearing. Then back off until nut slot lines up with pin hole. Insert spiral pin thru the M3 stud retaining the slotted nut in its position.
- 12.21.11 Rotate jackscrew assembly (2-210) counterclockwise until bearing is up against the outer end cap.
- 12.22 Install the outer end cap (2-30) onto the tie bars (2-60) and into the end of the cylinder (2-10).
- 12.23 Remove socket head cap screws (2-200) from jackscrew adapter and pull out jackscrew assembly until enough clearance is available to install tie bar nuts (2-90).
- 12.24 Install the two tie bar nuts (2-90) onto the tie bars (2-60), using them to draw all of the cylinder components into position. **CAUTION: While the nuts are being tightened, do not allow the tie bars to turn.** Torque alternately until a final torque of 65 foot pounds plus or minus 10% has been achieved. It is necessary that the flats on the hex nuts (2-90) be aligned and parallel before the jackscrew adapter can be installed.
- 12.25 Rotate the jackscrew assembly counterclockwise until end of CCW travel.
- 12.26 Insert jackscrew adapter (2-190) and jackscrew assembly (2-210) back into the outer end cap.
- 12.27 Retain jackscrew adapter (2-190) with socket head cap screws (2-200).
- 12.28 Tighten seal nut (2-130).
- 12.29 Install the two tie bar nuts (2-90) onto the tie bars (2-60), using them to draw all of the cylinder components into position. NOTE: While the nuts are being tightened, do not allow the tie bars to turn. Torque alternately until a final torque of 65 foot pounds plus or minus 10% has been achieved.
- 12.30 Install the nut retainer (2-100), securing in place with the retainer screw (2-120) and lockwasher (2-110). It is necessary that the flats on the hex nuts (2-90) be aligned and parallel before the nut retainer can be installed.

13.0 SPRING CARTRIDGE INSTALLATION

- 13.1 Make sure that the stop screws (1-60) have not been screwed into the point that "pre-load" will be created on the spring cartridge.
- 13.2 Install the end cap gasket (3-10) over push rod (4-20).
- 13.3 Prepare the SR cartridge (4-10) to be installed as follows: Remove the safety nuts, loose spacer plate, and gasket (4-70). Install replacement gasket over the tie bars, then install loose spacer plate over the tie bars.
- 13.4 Install the SR cartridge (4-10) onto the push rod (4-20). Do not allow the tie bars to be pushed back into the SR cartridge. Insert the tie bars thru the gasket (3-10) into the mating holes in the housing (1-10).
- 13.5 Screw the tie bars into the housing (1-10). Alternately tighten each until the SR cartridge is firmly attached to the housing.
- 13.6 Tighten each tie bar to 65 foot pounds plus or minus ten percent. Install the nut retainer (4-40) between the hex heads of tie bars. Retain by tightening screw (4-60) with lockwasher (4-50).

14.0 ACTUATOR TESTING

- 14.1 All areas, where leakage to atmosphere may occur, are to be checked using a leak testing solution.
- 14.2 Cycle the actuator five time at the nominal operating pressure (NOP) as per actuator name tag or per Chart 2 of this instruction for model being tested. This will allow the seals to seek their proper working attitude.
- 14.3 Stroke the actuator with the Nominal Operating Pressure and allow the unit to stabilize.
- 14.4 Apply a leak testing solution to the following areas:
 - 14.5 Joint between the outer end cap (2-30) and the cylinder (2-10). To check cylinder to end cap seal.
 - 14.6 Around the tie bar nuts on the cylinder end cap and on M3 equipped actuators around jackscrew adapter and seal nut, to check tie bar to end cap seals.
 - 14.7 Form a bubble over the breather port in the inner end cap (2-40). To check piston to cylinder, piston to tie bar, and piston to push rod seals.
 - 14.8 If excessive leakage across the piston is noted, generally a bubble which breaks three seconds or less after starting to form, the unit must be disassembled and the cause of leakage must be determined and corrected.
 - 14.9 If an actuator was disassembled and repaired, the above leakage test must be performed again.
- 14.10 Operational test the actuator to verify proper function of the actuator. This test is to be done off of the valve or when the valve stem is not coupled to the actuator yoke.
- 14.11 Before the operational testing may be accomplished, it will be necessary to provide a piping system whereby pressure may be applied simultaneously to all common pressure ports.
- 14.12 Adjust the pressure regulator to the pressure rating indicated in column "B" of Chart 2 of this instruction for the model actuator being tested.
- 14.13 Apply the above pressure to the actuator pressure inlet ports and allow the actuator to stabilize. The actuator should stroke a full 90° degree travel.
- 14.14 Remove pressure from the pressure inlet ports.

15.0 RETURN TO SERVICE

- 15.1 Install breather (4-30) in the inner end cap of the cylinder (2-10).
- 15.2 Replace the software components of the snubber (1-190) and then install the snubber into the housing cover.
- 15.3 Adjust both stop screws (1-60) back to settings recorded in step 5.3 under General Disassembly.
- 15.4 Tighten both jam nuts (1-120) securely, while holding stop screws (1-60).
- 15.5 Re-install any piping and accessories that were removed.
- 15.6 For actuators equipped with a M3 jackscrew override and require an optional handwheel, M3HW, install the handwheel using the following procedure:

- 15.7 Place the handwheel (8-10) onto the M3 stud and over the nut (the handwheel hub has a cast hexagon hole that fits over the nut).
- 15.8 Place lockwasher (8-20) onto M3 up against handwheel hub.
- 15.9 Place hex nut (8-30) onto M3 and thread up against lockwasher.
- 15.10 All accessories, including solenoid valves, positioners, pressure switches, etc., should be hooked up and tested for proper operations and replaced if found defective.
- 15.11 Using a tube of latex window caulk seal all joints that were removed or cut through during disassembly.
- 15.12 The actuator is now ready to be returned to service.

T3XX-SR & T4XX-SR RECOMMENDED

TOOL STYLE AND WRENCH SIZES

ITEM NO.	WRENCH SIZE	LOCATION	RECOMMENDED WRENCH STYLE
1-60	1/2"	Stop Screw	Open End or Adjustable Socket
1-90	9/16"	Cover Screws	Socket
1-120	1-5/16"	Stop Screw Nut	Box End (1)
1-180	3/16"	Weather Cover Screws	Allen
1-190	7/8"	Snubber Valve	Deep Socket
2-90	1-5/16"	Power Cylinder Tie Bar Nuts	Deep Socket
2-120	3/16"	Power Cylinder Nut Retainer	Allen
2-130	1-13/16"	M3 Jam Nut	Open End or Adjustable
2-170	1-1/4"	Piston Rod Flat	Crows Foot (1)
2-200	3/8"	M3 Adapter Screw	Allen (1)
4-20	(2)	SR Push Rod	Strap Wrench
4-60	3/16"	SR Nut Retainer	Allen
None	1-7/16"	SR Welded Tie Bar Nuts	Deep Socket
8	1-11/16"	M3 Handwheel Nut	Box End

(1) No alternate style recommended

(2) Wrench placement not provided

ECN	DATE	REV	BY *	DATE
Released	March 30, 1992	A	COMPILED O. K.	30 March 1992

CHECKED	<u>B. C.</u>	<u>30 March 1992</u>
APPROVED	<u>RMM</u>	<u>30 March 1992</u>

CHART 2**PRESSURE REQUIREMENTS & LIMITATIONS FOR****KT3XX-SRX & KT4XX-SRX SPRING RETURN SERIES ACTUATORS (1)**

<u>ACTUATOR MODEL (2)</u>	<u>NOMINAL OPERATING PRESSURE (NOP)</u>	<u>MAXIMUM OPERATING PRESSURE (MOP)</u>	<u>MAXIMUM ALLOWABLE WORKING PRESSURE</u>	<u>MAXIMUM AIR ASSIST PRESSURE (MAAP)</u>	<u>COLUMN B SPRING SELECTION PRESSURE</u>
KT310-SR5	61	210	250	110	50
KT310-SR4	85	220	250	98	65
KT310-SR3	112	235	300	82	81
KT310-SR2	146	250	300	68	96
KT310-SR1	217	300	325	23	145
KT312-SR5	43	150	225	77	36
KT312-SR4	60	155	225	68	46
KT312-SR3	78	165	225	57	57
KT312-SR2	102	175	225	47	68
KT312-SR1	152	200	225	16	105
KT316-SR4	37	95	130	42	29
KT316-SR3	49	105	130	35	35
KT316-SR2	64	110	130	29	42
KT316-SR1	95	130	130	10	63
KT410-SR5	102	290	325	157	71
KT410-SR4	130	315	325	142	87
KT410-SR3	163	315	325	129	101
KT410-SR2	247	315	325	80	156
KT412-SR5	71	200	225	109	50
KT412-SR4	91	220	225	99	62
KT412-SR3	114	220	225	90	72
KT412-SR2	173	220	225	55	110
KT412-SR1	217	220	225	34	134
KT416-SR5	44	125	150	67	32
KT416-SR4	57	135	150	61	38
KT416-SR3	71	135	150	56	45
KT416-SR2	108	135	150	34	70
KT416-SR1	135	135	150	21	84
KT420-SR4	36	85	90	38	25
KT420-SR3	45	85	90	35	29
KT420-SR2	68	85	90	21	44
KT420-SR1	85	85	90	13	54

NOTES:

- (1) Includes both fail clockwise (CW) and fail counterclockwise (CCW) actuator models.

- (2) Includes actuator models that have -M3 and -M3HW included in their model number, i.e. KT316-SR4(CW)-M3 or KT420-SR2(CCW)-M3HW.

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